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Space group and unit cell dimensions of copper (II)-tartarate complex

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Copper (II) tartarate complex (Cu $C_4H_4O_6$) is a light green microcrystallite substance whose magnetic and conductance data are of special interest. In this note, we have tried to find out the crystallographic system of the complex.

The CuK_α ($\lambda = 1{\cdot}5418$ Å) radiation from Machlett A-2 X-ray diffraction tube operated at 30KV and 20mA current was fed to a Rigaku camera of 9 cm diameter for 5 hrs at the room temperature of 27°C and the Debye-Scherrer pattern of the complex was obtained. The distance between the powder lines were measured and the corresponding Bragg's angles and $\sin^2\theta$ values were calculated accurately. Attempts were made to fit the data in table 1 to cubic, tetragonal and hexagonal systems by methods suggested by Azaroff *et al* (1958), D'eye *et al* (1960) and Henry *et al* (1951). As the data did not suit any of them, the procedure due to Lipson (1949) was attempted. The different diagrams were made and the constants were chosen.

For orthorhombic crystal,

$$\sin^2\theta = Ah^2+Bk^2+Cl^2,$$

where

$$A = \frac{\lambda^2}{4a^2}\ ,\ B = \frac{\lambda^2}{4b^2}\ ,\ \text{and}\ C = \frac{\lambda^2}{4c^2}\ .$$

Making allowance for the experimental error the constants were chosen as $A = 0{\cdot}005715$, $B = 0{\cdot}002936$ and $C = 0{\cdot}006770$. With these constants all the lines in the powder diagram could be indexed easily. The direct cell dimensions calculated from the above constants are,

$$a = 10{\cdot}1978\text{Å}, \quad b = 14{\cdot}2272\text{Å} \quad \text{and} \quad c = 3{\cdot}94135\text{Å}.$$

The observed value of density is 1·32199 gm/c.c. which is in good agreement with the calculated value of 1·26150 gm/c.c. The number of molecules per unit cell comes out to be 2. The study of indices (1952); *hkl, hko, hol, okl, hoo, oko*

Table 1

No. of line	Intensity	dÅ	$\sin^2\theta$		Indices
			Obs.	Cal.	
1.	s	7.1300	0.01169	0.01174	020
2.	vs	5.8479	0.01738	0.01746	120
3.	s	4.6807	0.02712	0.02708	002
4.	s	4.4473	0.03004	0.03001	012
5.	s	4.0937	0.03546	0.03573	112
6.	w	3.8020	0.04113	0.04137	221
7.	vvs	3.6529	0.04455	0.04454	122
8.	w	3.2255	0.05712	0.05746	141
9.	w	3.0704	0.06303	0.06318	320
10.	s	2.9278	0.06933	0.06958	113
11.	w	2.7447	0.07875	0.07915	150
				0.07852	302
12.	vvw	2.6965	0.08173	0.08145	312
13.	s	2.5451	0.09148	0.09144	400
14.	s	2.4548	0.09862	0.09821	401
15.	w	2.3643	0.10612	0.10619	152
				0.10590	043
16.	w	2.2981	0.11254	0.11236	303
17.	vw	2.2100	0.12089	0.12006	024
				0.12145	412
18.	s	2.1493	0.12830	0.12849	162
				0.12876	243
19.	vs	2.0314	0.14376	0.14292	224
				0.14290	500
20.	s	1.9775	0.15945	0.15975	304
21.	vw	1.8647	0.17034	0.16995	502
22.	vw	1.8227	0.17801	0.17879	433
23.	s	1.6634	0.21437	0.21498	082
				0.21422	045
				0.21421	462
24.	w	1.5118	0.25930	0.25924	632
25.	vw	1.4582	0.27996	0.28003	700
				0.27914	650
				0.27934	480
26.	w	1.4145	0.31268	0.31323	731
				0.31212	505
27.	vw	1.3397	0.33146	0.33173	007
				0.33178	741
28.	vw	1.2856	0.35973	0.36025	1,10,3
				0.36020	751
				0.35903	644
29.	vw	1.2806	0.36234	0.36202	0,11,1
				0.36227	266
				0.36158	436
30.	w	1.2257	0.39599	0.39577	812
31.	vw	1.1254	0.46806	0.46788	228
				0.46822	861
				0.46762	3,11,3
				0.46814	447
				0.46856	1,10,5
32.	vw	1.0973	0.48917	0.48968	901
				0.48943	1,12,3
				0.48853	862
33.	vw	0.9945	0.60173	0.60151	10,1,2
				0.60258	538

and *ool*; shows no condition of even-ness or oddness, hence the possible space group assigned to the complex is P_{222} or P_{mm2} or P_{mmm}.

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Total gamma ray cross sections in alloys in the energy region 145 to 1330 keV

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Eventhough many experimental attempts are made on total gamma ray cross-sections in elements, attempts in alloys are meagre (Rama Rao *et al* 1961, Rama Rao *et al* 1969, Ramana Rao *et al* 1968). Hence, in the present investigations, the experimental cross-sections in two typical alloys monel metal (Ni 60%, Cu 33%, Fe 6·5%, Mn 0·5%) and steel (W 23%, C 0·77%, Cr 4·25%, V 1·6%, Co 11%, Fe 59·38%) at gamma energies 145, 280, 320, 662, 840, 1115, 1280, 1330 keV are measured and the results along with the theoretical values are reported.